US Army Corps of Engineers®

R&D Program: TOWNS

Work Unit: Data Acquisition and Delivery Tools for Monitoring Watershed Networks

Needs & Problems Addressed:

- Near real-time data is often too widely space and slow to provide critical information in urban settings
- Need a versatile, low-cost, fixed site, and rapidly deployable sensor system capable of providing real-time data to forecast modelers, USACE, and local emergency operations personnel

Objectives:

- Identify processes and physical variables that need monitoring, identify new sensor needs, survey and evaluate appropriate existing and emerging sensor technology
- Develop a rapidly deployable, stand alone acquisition package to visually monitor and report the conditions of a river system and serve as a flashflood warning activation tool
- Evaluate the use of web-based tools for simplified integration of real-time sensor data feeds

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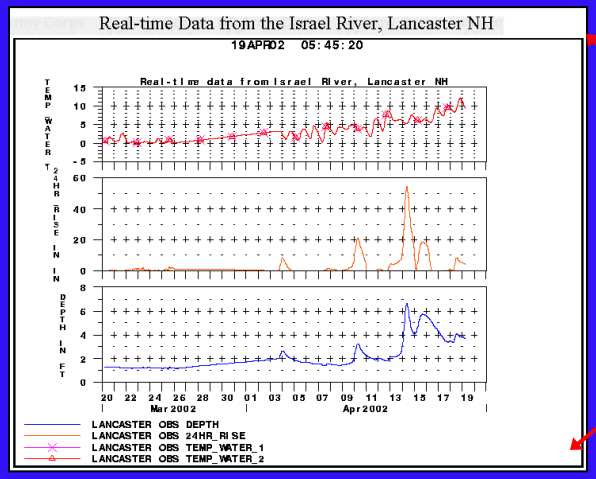
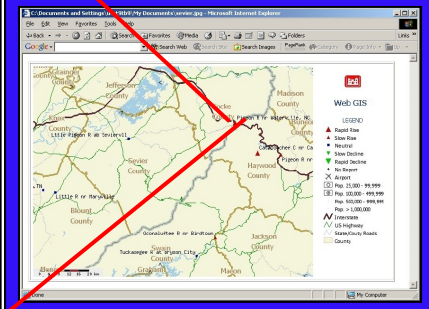
Work Unit Funding Profile:

FY03	FY04	FY05	Total
$ 215k	$ 200k	$ 0 k	$ 415k


Real-time Data from the Israel River, Lancaster NH
19APR02 05:45:20
Real-time data from Israel River, Lancaster NH
TEMP WATER T
24HR RISE IN
DEPTH IN FT
20 22 24 26 28 30 01 03 05 07 09 11 13 15 17 19
Mar 2002
Apr 2002
LANCASTER OBS DEPTH
LANCASTER OBS 24HR_RISE
LANCASTER OBS TEMP_WATER_1
LANCASTER OBS TEMP_WATER_2



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Business Program/Missions Areas Supported:

- Inland Navigation __ %
- Coastal Navigation __ %
- Coastal Storm Damage Reduction __ %
- Inland Flood Control/Damage Reduction 50 %
- Environmental Protection & Quality __ %
- Multi-Purpose (Hydropower, Rec & Water Supply) 10 %
- Emergency Management 40 %
- Regulatory __ %
- Support for Others __ %

(Must to add to 100%) Total: 100 %

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CW Strategic Goals Check List: (check if applies)

- Provide sustainable water resources development & mgmt _X_
- Restore past environment degradation ___
- Provide project services of high quality _X_
- Reduce losses from natural & manmade hazards _X_
- Supports being a world class technical leader _X_
- Addresses strategic or system needs in a framework or integrated approach by developing:
  - Methods or decision support tools _X_
  - Technology to improve life cycle productivity _X_
  - Technology to monitor systems, provide feedback and develop operating guidance _X_

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Which “short term” field needs does this support:

- Improves effectiveness of water control operations and emergency response
- Expedites decision-making
- Critical technology will be available to increase public safety

Field Review Group Relative Ranking

- FRG planned for 21-22 AUG 02

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Listening Sessions Check List: (check if applies)

- Improves data sharing/exchange with the public in these areas:
  - Provides one stop shop for maps & data for basin wide planning ___
  - Provides data to make informed decisions _X_
  - Provides a system for basin wide planning _X_
  - Provides information about what is happening at Corps facilities _X_ (up to date web sites)
- Tech Transfer plan to include educating the public X
- Coordinate research, models, analysis with regulatory agencies to insure results will be accepted _X_
- Develop R&D products:
  - For watershed management plans, not just at the project level _X_
  - To include aesthetics as components of all projects ___
- Create better models for ground & surface water ___

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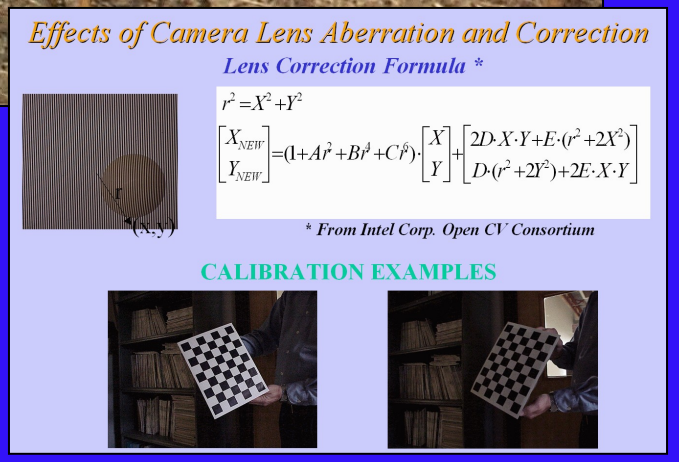
Work Unit: Data Acquisition and Delivery Tools for Monitoring Watershed Netwo

Products:

- Operating stage, precipitation, and rate of rise monitors in two demonstration watersheds
- Report on costs, installation requirements, performance, and recommendations for using monitoring systems
- Report describing existing sensors , their applicability to USACE needs, and new sensor needs
- Sensor and sensor platform selection guidance documents for USACE-wide use
- Web-based data delivery tools for technical flood warning personnel that integrate various data sources for assessing potential flood impacts
- Web site for public access to real-time hydro-meteorological data and other relevant spatial data


Effects of Camera Lens Aberration and Correction
Lens Correction Formula *
$r^2 = X^2 + Y^2$
$\begin{bmatrix} X_{NEW} \\ Y_{NEW} \end{bmatrix} = (1 + Ar^2 + Br^4 + Cr^6) \cdot \begin{bmatrix} X \\ Y \end{bmatrix} + \begin{bmatrix} 2D \cdot X \cdot Y + E \cdot (r^2 + 2X^2) \\ D \cdot (r^2 + 2Y^2) + 2E \cdot X \cdot Y \end{bmatrix}$
(X,Y)
* From Intel Corp. Open CV Consortium
CALIBRATION EXAMPLES

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Benefits

- Direct:
  - Simplify and enhance information integration for system operators and information dissemination to the public
  - Protection of property and life in urbanized watersheds
  - ROI includes decreasing loss of life
- Indirect:
  - Reduces risks to public safety
  - Provides fundamental knowledge for operating Corps projects

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Technology Transfer Plan:

- Demonstration projects with two districts (Nashville and possibly Los Angeles)
- Preparation of technical bulletins which describe system configurations
- Guidance document explaining system benefits, costs, installation, performance, monitoring and data retrieval techniques
- Reports distributed through internet, workshops, and conferences
- Web-based tools
- Program objectives and progress briefed at other programs
- Integration efforts with the EngLink and CWMS programs

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Why should the Corps fund this R&D, instead of private industry and/or others:

- This work addresses Corps operating systems and thus is of little interest to private industry

What is Impact if not started:

- Potential loss of life
- Inefficiencies in emergency operations